GarrettCom®

A BELDEN BRAND

Magnum 10ETS
Ethernet Terminal Server

Magnum 10XTS
Router Terminal Server

Hardware
Installation and User Guide

Magnum™ 10ETS / 10XTS Terminal Servers Hardware Installation and User Guide

Part #: 84-00191Z (Rev. C)

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Warranty:

Refer to current Belden Americas Terms & Conditions for warranty information.

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Compliance Statements

FCC Part 15

This equipment generates uses and can radiate frequency energy and if not installed and used properly in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at their own expense, will be required to take whatever measures may be required to correct the interference.

FCC Part 68

This device complies with part 68 of the FCC rules and the requirements adopted by the ACTA. On the bottom of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this number must be provided to the telephone company.

Note: REN (Ringer Equivalence Number) does not apply to this equipment.

IC CS03 (Industry Canada)

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the interference-causing equipment entitled "Digital Apparatus", ICES-003 of the department of Communications (Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Class A prescrites dans la norme sur le materiel brouilleur: "Appareils Numériques", NMB-003 édictée par le ministre des Communications).

This product meets the applicable Industry Canada technical specifications/Le présent materiel est conforme aux specifications techniques applicables d'Industrie Canada.

Electrical Safety requirements:

1. This product is to be installed Only in Restricted Access Areas (Dedicated Equipment Rooms, Electrical Closets, or the like).
2. All products shall be installed with a readily accessible disconnect device in the building installation supply circuit to the product.
3. This product shall be provided with a maximum 10A DC Listed fuse or circuit breaker in the supply circuit when connected to a 48V centralized source.
4. The external power supply for DC units shall be Listed, Direct Plug In power unit, marked Class 2, or listed ITE Power Supply, marked LPS, which has suitably rated output voltage (i.e. 24VDC or 48VDC) and suitable rated output current.
5. Product does not contain user replaceable fuses. Any internal fuses can ONLY be replaced by GarrettCom personnel through the RMA process.
6. The chassis main earthing screw shall be connected to the supply protective earthing conductor.

This equipment has the ordering option of being supplied to the purchaser without a Fiber Optic Class 1 Laser transceiver included. In this case, it is the responsibility of the purchasing party to apply the proper labeling required to the product, in accordance with US 21CFR Subchapter J Part 1040, if a transceiver is installed by the purchaser. (See label example below)

Complies with FDA radiation performance standards, 21CFR Subchapter J.

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Revisions:

Rev. A 06/12: Initial Release
Rev. B 07/12: added 10XTS
Rev. C 10/12: updated 10TS2-DB9 modules

1.0 SPECIFICATIONS

1.1 Technical Specifications

Serial Protocols:

Async to TCP/IP – including Modbus gateway for connectivity to serial Modbus devices and to other Modbus Ethernet devices

TCP/IP to serial/reverse terminal server, Serial Multipoint & Multimaster Topologies

PPP with authentication

Performance:

Serial DB9 Ports: RS232 only or RS232/RS485/RS422 software selectable DB9 interface. Serial data rate from 300 bps to 230.4 kbps.
Data length - 1-32 bits

Serial RJ45 Ports: Same functionality as DB-9 ports (RJ45 pinout conforms to EIA-561 DTE standard)

RJ45 Ports: 100 or 10 Mb speed, full- or half-duplex mode, per port, individually determined.10/100 auto-negotiating & auto-cross

Fiber Ports, 100 Mb (multi-mode and single-mode):
Configurable in modules. at 2 per module, or SFF (Small Form Factor) for high fiber port density, 4 per module. Each FDX or HDX, default is FDX mode.

WAN Ports: T1/E1: 1.544 Mbps / 2.048 Mbps G.703

Network Standards and Compliance, hardware:

Ethernet V1.0/V2.0 IEEE 802.3: 10BASE-T,
IEEE 802.3u: 100Base-TX, 100BASE-FX, Auto-negotiation on TP
IEEE 802.1p: Priority protocol
IEEE 802.1d: Spanning Tree protocol
IEEE 802.1w: Rapid Spanning Tree protocol
IEEE 802.1q: VLAN Tagging, maximum 32 VLANs
IEEE 802.3x: Flow Control

Maximum 10 Mbps Ethernet Segment Lengths:

Shielded twisted pair	- 150 m (492 ft)
10BASE-FL multimode fiber optic	- 2 km (6562 ft)

Maximum Standard Fast Ethernet Segment Lengths:

10BASE-T (CAT 3, 4, 5 UTP)	- 100 m (328 ft)
100BASE-TX (CAT 5 UTP)	- 100 m (328 ft)
Shielded twisted pair	- 150 m (492 ft)
100BASE-FX, half-duplex, multimode	- 412 m (1350 ft)
100BASE-FX, full-duplex, multimode	- 2.0 km (6562 ft)
100BASE-FX, half-duplex, singlemode	- 412 m (1350 ft)
100BASE-FX, full-duplex, singlemode	- 20.0 km (66K ft)
100BASE-FX, full-duplex, Long Reach	- 40.0 km (122K ft)

Fiber Multimode connector types supported:

Fiber Port, LC-type (plug-in): SFF/SFP fiber multimode 100BASE-FX
Fiber Port, MTRJ-type (plug-in): SFF fiber multimode 100BASE-FX
Fiber Port, SC-type (plug-in), multimode 100BASE-FX
Fiber Port, ST-type (twist-lock), multimode 100BASE-FX

Fiber Singlemode connector types:

Fiber Port, LC-type, Fiber SFF/SFP singlemode, 100BASE-FX
Fiber Port, SC-type, singlemode, 100BASE-FX

Serial LEDs: Per DB-9 or RJ45 port

(see section 5.1.1 for detailed LED configurations)
One LED/port indicating active connection

Ethernet LEDs: Per RJ45 or Fiber port

(see section 5.1.1 for detailed LED configurations)
One LED/port indicating LINK (solid green) and ACTIVITY (blinking)

Operating Environment:

Ambient Temperature:
-40° to 140° F (-40° to 60°C) for UL 60950 Component Parts rating
-40° to 185° F (-40° to 85°C) for IEC 60068 Type Test short term rating
Storage Temperature: -40° to 185°F (-40°to 85°C)
Ambient Relative Humidity: 5% to 95% (non-condensing)
Altitude: -200 to 13,000 ft. (-60 to 4000m)
Conformal Coating (humidity protection) optional: Request quote

Alarm Relay Contacts:

Form C, One NC indicating internal power, one NC software controllable
10ETSP / 10XTSP (PoE chassis): One Form C, NC/NO software controllable

Mechanical:

Enclosure: High strength steel, 1U rack-mounting or stand-alone
Dimensions: 1.74 in H x 17.5 in W x 12.0 in D
(4.4 cm H x 44.5 cm W x 30.5 cm D)
Cooling method: Convection, special (patent pending) thermal techniques
Weight: 10.6 lbs. (4.8 kg)

DC Power Supply (Internal, floating ground)

DC Power Connector: Terminal block
(L) 24/48VDC Power Input (range 22 to 60VDC)

for PoE applications:
PoE+ 802.3at: (L) 48VDC Power Input (range 52 to 56VDC)

(H) AC/DC Power Input (range 90-250V AC or DC)
Standard 3-screw Terminal Block: " -, +, GND "

Power Consumption:

20 watts Max. (for a fully populated unit)

AC Power Supply (Internal)

AC Power Connector: IEC-320/C14 type, male recessed
100-240VAC Power Input, 47 to 63 Hz (auto-ranging)

Management Console Connector

RJ45, see details at Section 3.6

Mounting:
Rack-mounting, normal method.

Unit supplied with rack-mounting brackets for mounting in a 19" rack.

Agency Approvals and Standards Compliance:

UL listed (UL60950), cUL, CE
Emissions (EN55022) meet FCC Part 15 Class A
IEEE 1613 Class 2 Environmental Standard for Electric Power Substations
See also **Note for Power Substations** in Section 3.2.1 and 5.1.5
IEC 61850-3 EMC and Operating Conditions Class C for Power Substations
NEMA TS-2 for Traffic Control
EN50155 for Railways

Warranty: Refer to current Belden Americas Terms & Conditions for warranty information.

Email **info@GarrettCom.com** for additional information.

1.2 Ordering Information

10ETS Ethernet Terminal Server - w/Hot Swap power supplies

MODEL **DESCRIPTION**

10ETS-HSPHH: Magnum 10ETS Terminal Server, front-mount, with two PS slots for two (H) Hot-Swap Power Supplies. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10ETSR-HSPHH: Same as Model 10ETS-HSPHH except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETS-HSPHL: Magnum 10ETS Terminal Server, front-mount, with two PS slots for one (H) and one (L) Hot-Swap Power Supply. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10ETSR-HSPHL: Same as Model 10ETS-HSPHL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETS-HSPLL: Magnum 10ETS Terminal Server, front-mount, with two PS slots for two (L) Hot-Swap Power Supplies. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10ETSR-HSPLL: Same as Model 10ETS-HSPLL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETSP-HSPLL: Magnum 10ETS Terminal Server, front-mount, with two PS slots for two (L) Hot-Swap Power Supplies. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations. **Supports PoE**

10ETSPR-HSPLL: Same as Model 10ETSP-HSPLL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear). **Supports PoE**

10ETS Ethernet Terminal Server - w/Fixed power supplies

MODEL **DESCRIPTION**

10ETS-H: Magnum 10ETS Terminal Server, front-mount, with integral 90-250V AC/DC Power Supply. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10ETSR-H: Same as Model 10ETS-H except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETS-HH: Same as Model 10ETS-H except the chassis contains two integral 90-250V AC/DC Power supplies.

10ETSR-HH: Same as Model 10ETS-HH except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETS-L: Same as Model 10ETS-H except the integral power supply is (L) 24/48VDC.

10ETSR-L: Same as Model 10ETS-L except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETS-LL: Same as Model 10ETS-L except the chassis contains two integral (L) 24/48VDC Power supplies.

10ETSR-LL: Same as Model 10ETS-LL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETS-HL: Same as Model 10ETS-HH except the integral power supplies are one H 90-250V AC/DC and one L 24/48VDC.

10ETSR-HL: Same as Model 10ETS-HL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETS-AC: Same as Model 10ETS-H except the power supply is an auto-sensing worldwide AC power type (100-240V AC) using a UL-registered recessed-male IEC 320 plug.

10ETSR-AC: Same as Model 10ETS-AC except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10ETSP-L: Magnum 10ETS Terminal Server, front-mount, with integral (L) 24/48V DC Power Supply. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations. **Supports PoE**

10ETSPR-L: Same as Model 10ETSP-L except chassis is a Reverse Mount unit. (All signal and power cables are in the rear). **Supports PoE**

10ETSP-LL: Same as Model 10ETSP-L except the chassis contains two integral (L) 24/48VDC Power supplies.

10ETSPR-LL: Same as Model 10ETSP-LL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

Please use this URL for the complete Configuration Guide for the Magnum 10ETS.
http://www.garrettcom.com/techsupport/hardware/datasheets/10ets_dscs.pdf

10XTS Router Terminal Server - w/Hot Swap power supplies

MODEL **DESCRIPTION**

10XTS-HSPHH: Magnum 10XTS Terminal Server, front-mount, with two PS slots for two (H) Hot-Swap Power Supplies. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10XTSR-HSPHH: Same as Model 10XTS-HSPHH except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTS-HSPHL: Magnum 10XTS Terminal Server, front-mount, with two PS slots for one (H) and one (L) Hot-Swap Power Supply. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10XTSR-HSPHL: Same as Model 10XTS-HSPHL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTS-HSPLL: Magnum 10XTS Terminal Server, front-mount, with two PS slots for two (L) Hot-Swap Power Supplies. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10XTSR-HSPLL: Same as Model 10XTS-HSPLL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTSP-HSPLL: Magnum 10XTS Terminal Server, front-mount, with two PS slots for two (L) Hot-Swap Power Supplies. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations. **Supports PoE**

10XTSPR-HSPLL: Same as Model 10XTSP-HSPLL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear). **Supports PoE**

10XTS Router Terminal Server - w/Fixed power supplies

MODEL **DESCRIPTION**

10XTS-H: Magnum 10XTS Terminal Server, front-mount, with integral 90-250V AC/DC Power Supply. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations.

10XTSR-H: Same as Model 10XTS-H except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTS-HH: Same as Model 10XTS-H except the chassis contains two integral 90-250V AC/DC Power supplies.

10XTSR-HH: Same as Model 10XTS-HH except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTS-L: Same as Model 10XTS-H except the integral power supply is (L) 24/48VDC.

10XTSR-L: Same as Model 10XTS-L except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTS-LL: Same as Model 10XTS-L except the chassis contains two integral (L) 24/48VDC Power supplies.

10XTSR-LL: Same as Model 10XTS-LL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTS-HL: Same as Model 10XTS-HH except the integral power supplies are one H 90-250V AC/DC and one L 24/48VDC.

10XTSR-HL: Same as Model 10XTS-HL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTS-AC: Same as Model 10XTS-H except the power supply is an auto-sensing worldwide AC power type (100-240V AC) using a UL-registered recessed-male IEC 320 plug.

10XTSR-AC: Same as Model 10XTS-AC except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

10XTSP-L: Magnum 10XTS Terminal Server, front-mount, with integral (L) 24/48V DC Power Supply. May be factory-configured with a variety of Ethernet fiber and copper port modules and Serial port modules designed specifically for the 10ETS/XTS. Configure up to 36 ports in a mix of Ethernet and Serial port combinations. **Supports PoE**

10XTSPR-L: Same as Model 10XTSP-L except chassis is a Reverse Mount unit. (All signal and power cables are in the rear). **Supports PoE**

10XTSP-LL: Same as Model 10XTSP-L except the chassis contains two integral (L) 24/48VDC Power supplies.

10XTSPR-LL: Same as Model 10XTSP-LL except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

Please use this URL for the complete Configuration Guide for the Magnum 10XTS.

http://www.garrettcom.com/techsupport/hardware/datasheets/10xts_dscs.pdf

"HSP" Hot-Swap power supply options:

HSPM-H: AC or DC power (90-250V)

HSPM-L: 24/48V DC power (22-60V)

HSPM-BLNK: Blank cover for one hot-swap power supply slot

Following Ethernet 10/100Mb modules can be configured in Slots A and/or B only

Magnum 10ETS/XTS (Slots A, B) Port Modules:

10TS2-RJ45 Module with two 10/100Mb RJ45 ports

10TS2-HSFP Module with two 100Mb SFP open ports

100Mb SFP transceiver options for Slots A & B (Slot C w/10K4-FXSFP module):

SFP100P-FXMM2 100Mb SFP transceiver, Multimode, 2km

SFP100P-FXSM20 100Mb SFP transceiver, Singlemode, 20km

SFP100P-FXSM40 100Mb SFP transceiver, Singlemode, 40km

SFP100P-RJ45 100Mb SFP transceiver, RJ45 (auto-negotiating)

Following IRIG-B module can be configured in Slot B only

IRIGB-TMODULE Timing module for IRIG-B w/two BNC connectors

Following modules can be configured in Slot C only

Magnum 10ETS/XTS (Slots C) Port Modules:

10K4-RJ45 Module w/four 10/100 RJ45 ports

10K4PX-RJ45 Module w/four 10/100 RJ45 ports with PoE+ (802.3at) support

10K4-MLC Module w/four 100Mb multimode fiber LC ports

10K4-SLC Module w/four 100Mb singlemode fiber LC ports (20km)

10K4-SLCL Module w/four 100Mb "long-haul" singlemode fiber LC ports (40km)

10K4-MTRJ Module w/four 100Mb multimode fiber MTRJ ports

10K2-MST Module w/two multimode ST fiber ports

10K2-F10ST Module w/two multimode 10Mb ST fiber ports

10K2-MSC Module w/two multimode SC fiber ports

10K2-SSC Module w/two singlemode SC fiber ports

10K2-SSCL Module w/two "long-haul" singlemode SC fiber ports

10K4-FXSFP Module w/four 100Mb open SFP transceiver ports

Following Serial modules can be configured in Slots C-J only

Magnum 10ETS/XTS (Slots C-J) Port Modules:

***10TS2-DB9-X-IRIGB**	Module w/two port DB-9 (female) with IRIG-B
10TS2-DB9-DCE	Module w/two port DB-9 (female DCE)
***10TS2-DB9-DCE-IRIGB**	Module w/two port DB-9 (female DCE) with IRIG-B
10TS2-DB9-DTE	Module w/two port DB-9 (female DTE)
***10TS2-DB9-DTE-IRIGB**	Module w/two port DB-9 (female DTE) with IRIG-B
10TS4-RJ45	Module w/four port RJ45
***10TS4-RJ45-IRIGB**	Module w/four port RJ45 with IRIG-B

*** Requires IRIGB-TMODULE in Slot B**

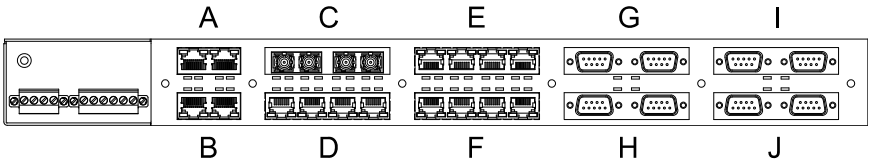
Following module can be configured in Slot I only for the 10XTS

(Not available for the 10ETS)

Magnum 10XTS (Slot I) Port Module:

10-2T1E1 Dual T1/E1 WAN adapter

Slot locations:



Options & Extras:

CONSOLE-CBLQD: Console attachment cable. Serial null modem (aka X-modem) cable with RJ45 connector for the 10ETS/XTS on one end and a DB-9 connector on other end.

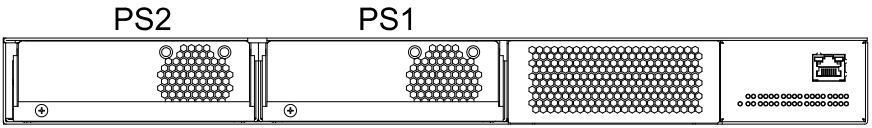
CONSOLE-CBLQU: Same as above, but with USB connector

MNS-DX-SECURE: Optional, licensed software per 10ETS/XTS for extra security.

CONFORM05-RMOD: Conformal coating, heavy duty silicone at 5 mil thickness, for interior PCBs, PS and modules (for moisture protection)

CONFORM08-RMOD: Conformal coating, heavy duty silicone at 8 mil thickness, for interior PCBs, PS and modules (for corrosion in paper, mining, and oil & gas industries)

Hot-Swap power supply locations:



2.0 INTRODUCTION

2.1 Inspecting the Package and Product

Examine the shipping container for obvious damage prior to installing this product; notify the carrier of any damage that you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

1 Magnum 10ETS/XTS Terminal Server, base unit

(configured with user-selected port module options installed, and factory-loaded MNS-DX or MNS-DX-SECURE software installed)

1 Set of two metal 19" rack-mounting brackets, with screws into case.

Remove the items from the shipping container. Be sure to keep the shipping container should you need to re-ship the unit at a later date.

In the event there are items missing or damaged, contact the party from whom you purchased the product. If the unit needs to be returned, please use the original shipping container if possible. Refer to Section 6, Troubleshooting, for specific return procedures.

2.2 Product Description

Magnum 10ETS Ethernet Terminal Server

The Magnum 10ETS Terminal Server provides "Next-Generation" configurability, reliability and functionality in a 1U hardened rack-mount package. The 10ETS offers space efficiency and advanced serial and Ethernet ports configurability for heavy duty industrial applications where maximum port count and diversity are required. The 10ETS also offers the flexibility of switching or routing on all of the Ethernet ports. Each 10ETS Managed Terminal Server includes advanced thermal design techniques that result in cooler operation of internal electronic components, leading to longer life-time and increased reliability.

See 10ETS Product bulletin for more information.

http://www.garrettcom.com/techsupport/hardware/datasheets/10ets_dscs.pdf

10ETSR (Reverse mount shown)

Magnum 10XTS Router Terminal Server

The Magnum 10XTS Router Terminal Server offers T1/E1 routing as well as advanced serial and Ethernet port configurability for heavy duty industrial applications where maximum port count and diversity are required. The Magnum 10XTS is ideal for large substation installations with large numbers of serial and Ethernet instruments and the need for high-speed WAN access.

The Magnum 10XTS offers two WAN ports via a T1/E1 card, up to eight Ethernet ports or 28 serial ports and IRIG-B time coding. The 10XTS provides configurability, reliability, and functionality in a 1U hardened rack-mount package. The 10XTS also offers the flexibility of switching or routing on all of the Ethernet ports. Each 10XTS Router Terminal Server includes advanced thermal design techniques that result in cooler operation of internal electronic components, leading to longer life-time and increased reliability.

See 10XTS Product bulletin for more information.

http://www.garrettcom.com/techsupport/hardware/datasheets/10xts_dscs.pdf

10XTS (Front mount shown)

2.3 Managed Network Software for Magnum 10ETS/XTS

Magnum 10ETS/XTS comes with licensed MNS-DX software or MNS-DX-SECURE, which allow the user to configure the Magnum 10ETS/XTS as a Managed Switch and implements security features and other software-enabled features.

(NOTE: Magnum 10ETS/XTS will work with MNS-DX Rel v3.1.6 firmware or higher version only. Using any earlier MNS-DX Rev-level versions will not provide support for the Magnum 10ETS/XTS Terminal Server)

For additional information about MNS-DX, see the Magnum MNS-DX **Software User guide** in pdf format, a separate document normally accessible via your web-browser, at http://www.garrettcom.com/techsupport/index.htm#software and look for the Magnum MNS-DX info.

You may also email: info@GarrettCom.com for further information.

2.4 Features and Benefits

- **Dual Hot-swappable power supplies**
  The Magnum 10ETS/XTS offers configurable Dual Hot-Swappable power supplies for redundancy and increased reliability. Available for "H" AC/DC and "L" 48/24VDC.

- **IRIG-B Timing modules**
  The Magnum 10ETS/XTS offers precision IRIG-B timing synchronization to Protection and SCADA devices.

- **Managed switching for high performance Ethernet LANs**
  The Terminal Server provides non-blocking (all ports can run at full speed at once) performance with standard Managed Network Software.

- **Switching services includes 802.1p QoS packet prioritization**
  The Magnum 10ETS/XTS switching hardware supports QoS, giving packet processing priority to priority tagged packets according to the IEEE 802.1p 4-level standard. For port- and application-specific priorities of data, including VLANs, the QoS software may be configured by the user.

- **Fiber Port configurability**
  Magnum 10ETS/XTS Terminal Servers are designed to naturally include fiber ports, and support mixes of multimode, singlemode, 10Mb and 100Mb speed; full-and half-duplex; classic FX Small Form Factor (SFF) and Small Form Pluggable (SFP) connectors for fiber cable.

- **Relay Contacts for monitoring internal power and user-defined software events**
  Two Alarm Relay contacts monitor basic operations. One is for hardware, and will signal loss of power internally. The other is software controlled and will signal user-defined software events such as a security violation or a redundancy fault condition.

- **19" Rack-mounting**
  The standard rack mounting provides Ethernet ports, Serial ports and status LEDs in front, service connections (power input and management console) in the rear. "Reverse" rack mounting provides status LEDs in front and all cabling connections in the rear. For best reliability and cooling, 1U vertical space above and below is recommended.

- **Heavy-duty design for Industrial applications and extended temperature operation**
  10ETS/XTS Terminal Servers includes advanced thermal design techniques that result in cooler operation of internal electronic components, leading to longer life-time and increased reliability. The ambient temperature dual-rating is 60`C per UL methods, and 85°C per IEC type test methods.

- **MNS-DX licensed Management Software**
  Managed Networks Software (MNS) basic version, combined with a Magnum 10ETS/XTS, provides power and efficiency in a managed Ethernet platform. A full range of industry-standard software functions in the MNS-DX software product enables the versatile Magnum 10ETS/XTS to perform efficiently in a wide range of managed LAN applications, including redundant topologies.

- **MNS-DX-SECURE (optional, for extra security)**
  Magnum MNS-DX-SECURE software is designed for those customers demanding extra security in their networks. MNS-DX-SECURE is an optional item--licensed per 10ETS/XTS. All of the features in regular MNS-DX are included, plus extra security.

- **RSTP-2004 for rings and meshes, fastest fault recovery, interoperability**
  RSTP-2004 provides reliable fast recovery from a fault in a redundant LAN, which may include Magnum switches and routers as well as other vendors industry-standard-RSTP products. Redundant topologies may include rings, dual-rings, and complex meshes.

3.0 INSTALLATION

Before installing the equipment, it is necessary to take the following precautions:

1.) If the equipment is mounted in an enclosed or multiple rack assembly, the steady-state long-term environmental temperature around the equipment must be less than or equal to 60^0C.

2.) If the equipment is mounted in an enclosed or multiple rack assembly, adequate airflow must be maintained for proper and safe operation.

3.) If the equipment is mounted in an enclosed or multiple rack system, placement of the equipment must not overload or load unevenly the rack system.

4.) If the equipment is mounted in an enclosed or multiple rack assembly, verify the equipment's power requirements to prevent overloading of the building/s electrical circuits.

5.) If the equipment is mounted in an enclosed or multiple rack assembly, verify that the equipment has a reliable and uncompromised earthing path.

This section describes installation of the Magnum 10ETS/XTS Ethernet Terminal Server, as well as connection of the various Ethernet media and Serial port types.

3.1 Locating Magnum 10ETS/XTS Terminal Servers

For Rack-mounting, see Section 3.3

For DC power input data, see Appendix A.

The rugged metal case of the Magnum 10ETS/XTS will normally protect it from accidental damage in an industrial lab or workplace setting. Maintain an open view of the front to visually monitor the status LEDs. Keep an open area around the unit so that cooling can occur from convection while the unit is in operation. The 10ETS/XTS has no fans, so it is silent when in operation. Internal electronics use the case as a heat sink, so the unit may normally be quite warm to the touch.

When connecting the Ethernet cabling, there is no need to power down the unit. Individual cable segments can be connected or disconnected without concern for power-related problems or damage to the unit.

3.2 Connecting Network Cables

The Magnum 10ETS/XTS is specifically designed to support standard Ethernet and Serial media types within a single unit. This is accomplished by supporting all popular fiber and copper port connectors which can be individually selected and configured. (See Section 5.1 for a description of the Port Modules choices, Request a quote if you do not see the ones you want.)

NOTE: Shielded cable is required for ALL copper ports (RJ45 / DB9)

The various media types supported along with the corresponding IEEE 802.3 standards and connector types are as follows:

Media	IEEE Standard	Connector
Twisted Pair (CAT 3 or 5)	10BASE-T	RJ45
Twisted Pair (CAT 5)	100BASE-TX	RJ45
Fiber (Multimode)	10BASE-FL	ST
Fiber (Multimode)	100BASE-FX	LC, SC, ST, MTRJ
Fiber (Singlemode)	100BASE-FX	LC, SC

See http://www.garrettcom.com/techsupport/power_budget.pdf for Power budget calculations, to find fiber cable distance information.

3.2.1 Connecting Shielded Twisted Pair (CAT3, CAT5)

The RJ45 ports of the Magnum 10ETS/XTS can be connected to the following two media types: 100BASE-TX and 10BASE-T. CAT 5 or better cables should be used when making 100BASE-TX connections. When the ports are used as 10BASE-T ports, CAT 3 may be used.

NOTE : *It is recommended that high quality CAT 5 shielded cable be used whenever possible in order to provide flexibility in a mixed-speed network, since 10/100 copper switched ports are auto-sensing for either 10 and 100Mb/s.*

The following procedure describes how to connect a 10BASE-T or 100BASE-TX twisted pair segment to the RJ45 port.

1. Using standard twisted pair media, insert either end of the cable with an RJ45 plug into the RJ45 connector of the port.
2. Connect the other end of the cable to the corresponding device
3. Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the unit is powered and proper connection is established.

NOTE: for Power Substations: In support of the IEEE 1613 Class 2 standard, GCI advises that, for substation applications, the RJ45 ports are intended for connectivity to other communication equipment such as routers or telecommunication multiplexers installed in close proximity (i.e., less than 2 meters or 6.5ft) to the 10ETS/XTS. It is not recommended to use these ports in substation applications to interface to field devices across distances which could produce high (greater than 2500V) levels of ground potential rise (GPR) during line-to-ground fault conditions. The 10ETS/XTS passes the 1613 specifications for zero packet loss with fiber ports & with RJ45 ports used as indicated here.

LASER WARNING: DO NOT LOOK INTO A FIBER OPTIC CABLE OR PORT! These can produce invisible light that may do serious eye damage. Always assume that fiber optic cables or

3.2.2 Connecting Singlemode Fiber Optic

When using singlemode fiber cable, be sure to use singlemode fiber port connectors. Singlemode fiber cable has a smaller diameter than multimode fiber cable (9/125 microns for singlemode, 50/125 or 62.5/125 microns for multimode where xx/xx are the diameters of the core and the core plus the cladding respectively). Singlemode fiber allows full bandwidth at longer distances, about 70km with the singlemode LC.

3.2.3 SFP (Small Form-factor Pluggable) Transceivers

The small form-factor pluggable (SFP) is a compact fiber optic transceiver used in optical communications for both telecommunication and data communications applications. Due to its compact, hot pluggable characteristics, SFPs are becoming a very popular choice for various applications. The Magnum 10ETS/XTS is designed for industry-standard SFPs for user selection of the SFP media type as desired.

All SFPs used in the Magnum 10ETS/XTS are compliant with the industry standard Multi-Source Agreement (MSA) ensuring compatibility with a wide range of networking kit.

(see Section 1.2 for the SFP's available for the 10ETS/XTS)

Note: It is highly recommended to remove the fiber cable first before removing the SFP transceiver for any reason. Not removing the fiber cable first can damage the fiber cable, cable connector or optical interfaces. It is advised not to remove and insert a SFP transceiver frequently as this may shorten its useful life.

Note: Always use an ESD wrist strap while handling the SFP transceivers since the SFP modules are static sensitive devices.

3.2.4 Connecting Fiber Optic Cable to SFP Transceivers

1. Before connecting the fiber optic cable, remove the protective dust caps from the module connectors. Save these dust caps for future use.

2. Wipe clean the ends of the dual connectors with a soft cloth or lint-free lens tissue dampened in alcohol. Make certain the connectors are clean before connecting.

Note: One strand of the duplex fiber optic cable is coded using color bands at regular intervals; you must use the color-coded strand on the associated ports at each end of the fiber optic segment.

3. Find the Transmit (TX) and Receive (RX) markings on the SFP transceiver to verify the top side of it. Some of the transceivers show a arrow mark for up.

4. Position the SFP transceiver correctly before insertion, and then insert the SFP transceiver carefully, until the transceiver connector snap into the place in the socket connector.

5. Connect the Transmit (TX) port on the Magnum module to the Receive (RX) port of the remote device. Connect the Receive (RX) port on the module to the Transmit (TX) port of the remote device.

3.2.5 Connecting DB9 Serial ports

This procedure assumes that one end of the serial device cable is already attached to the end unit. Be aware of the serial port numbering scheme when installing the cables. The ports are configured in software later on and if a device is accidentally connected to the wrong port it will be difficult to detect. Connect cables to the Serial ports as described below:

1. Align the DB9 connector with appropriate serial port and push gently until the connector is completely mated to the port.

2. Tighten the two extended capture screws hand tight.

3. Make sure that the connector is not supporting the whole weight of the cable. Providing strain relief on these cables will ensure a stable connection.

4. Return to step one above and connect the remainder of the serial cables.

The LINK LED on the front of the module will illuminate and turn Green, when a proper connection has been established at both ends (and when power is ON in the unit). If LINK is not lit or OFF after cable connection, the normal cause is improper cable polarity. Swap the fiber cables at the module connector and also check the connectivity on the target device to remedy this situation.

Reconfigure or reboot both of the devices if required.

If connected properly, you can check via (MNS-DX) software for verifying the validity of the ports.

3.3 Mounting

The Magnum 10ETS/XTS Terminal Server can be easily mounted on a table-top or any suitable horizontal surface. They have four rubber feet to provide stability without scratching finished surfaces.

3.3.1 Rack-mounting options

Installation of a Magnum 10ETS/XTS in a 19" rack is a simple procedure. The units are 1U (1.74") high. When properly installed, the front-mounted LED status indicators should be in plain view and easy to read.

Rack-mount installation requires special 19" rack-mounted brackets and screws (included with each Magnum 10ETS/XTS unit). These brackets attach to the each side of the Switch which is then typically fastened into a standard 19" RETMA rack.

3.3.2 Rack-mounting, Reverse mount option

The optional Reverse Magnum 10ETSR/10XTSR model has all of the cabling (Ethernet, Serial, and Power) connectors in the rear, and the status LEDs and console port in the front. The status LEDs that are co-incident with the ports are still present and a second or dual set of LEDs are used for status visibility in the front of the unit, showing the same data.

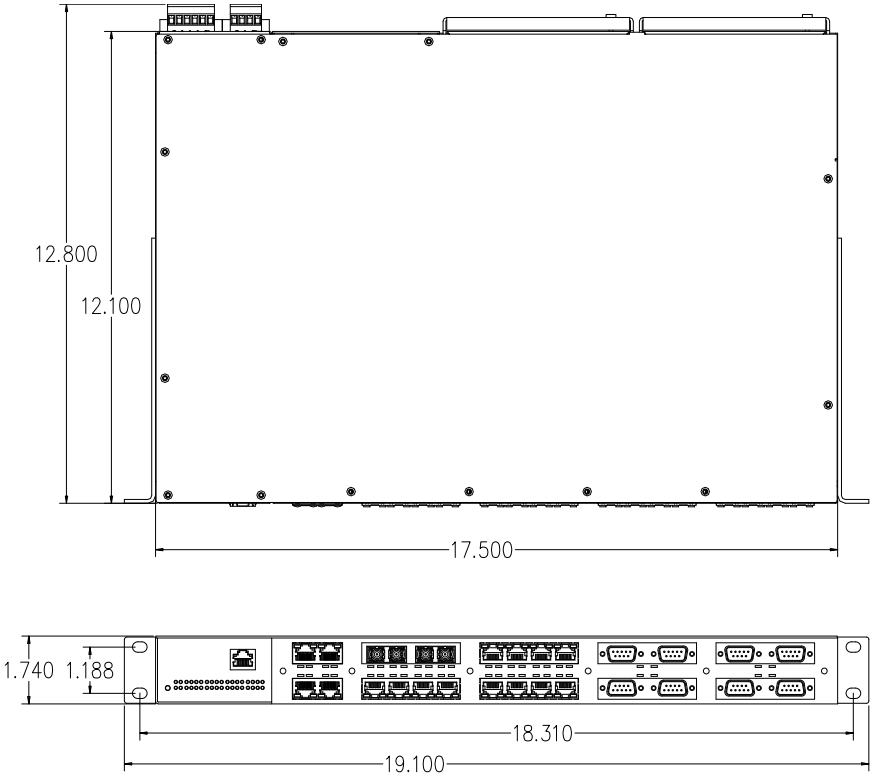


Fig 3.3a 10ETS/XTS front mount dimensions

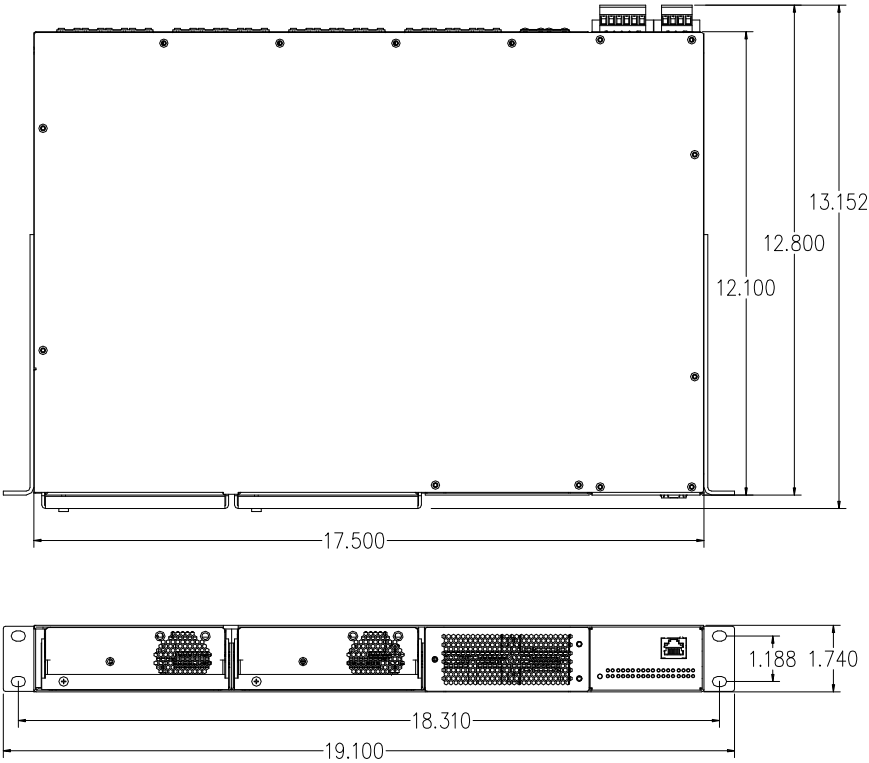


Fig 3.3b 10ETS/XTS reverse mount dimensions

3.4 Powering the Magnum 10ETS/XTS Terminal Server

The Magnum 10ETS/XTS is available with the choice of Dual Hot-Swappable power supplies or a single fixed (non Hot-Swappable) internal power supply.

The Hot-Swappable power supplies are available with 90-250V AC/DC and 24/48V DC power inputs. They are normally used as matching pairs.

The fixed internal power supply is available with 90-250V AC/DC, 24/48V DC and AC 100-240V (via IEC connector) power inputs.

When connecting the Ethernet or Serial cabling, there is no need to power down the unit. Individual cable segments can be connected or disconnected without concern for power-related problems or damage to the unit.

(see Section 1.2, for Ordering Information)

3.4.1 Power Input connection

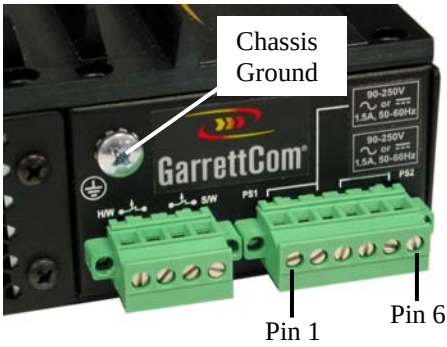


Fig 3.4.1a AC/DC power input

PS1 (Power Supply 1)
- Pin 1: - (Negative)/N
- Pin 2: + (Positive)/L
- Pin 3: Ground

PS2 (Power Supply 2)
- Pin 4: Ground
- Pin 5: - (Negative)/N
- Pin 6: + (Positive)/L

Fig 3.4.1b AC power input
Connection made via IEC 320/C14 3-prong male connector

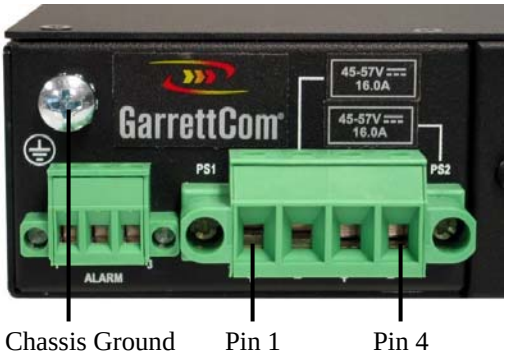


Fig 3.4.1c PoE power input

PS1 (Power Supply 1)
Pin 1: + (Positive)/L
Pin 2: - (Negative)/N
Chassis Ground
PS2 (Power Supply 2)
Pin 3: + (Positive)/L
Pin 4: - (Negative)/N
Chassis Ground

3.5 Alarm Contacts for monitoring internal power, and Software Traps

The Alarm Contacts feature, standard on the Magnum 10ETS/XTS, provides two Form C Normally Closed (NC) contacts to which the user can attach two sets of status monitoring wires at the Alarms terminal block, see Fig 3.5a below.

The first NC Alarm Contact is held closed when there is power on the main board inside of the Switch. This provides a "Hardware Alarm" (labeled H/W) because the NC contacts will open when internal power is lost, either from an external power down condition or (if not a Hot-Swappable Power Supplies switch unit) by the failure of the power supply inside of the Magnum Switch.

The second NC Alarm Contact is a "Software Alarm" (labeled S/W), operated by user settings in the MNS-DX software. The user can disable the Software Alarm feature with a software configuration command if desired. When the Software Alarm is enabled, the Form C Normally Closed (NC) contact is held close during normal software operation. A user-defined software malfunction, such as an SNMP Trap or a Software Security violation or an RSTP Fault, causes the contact to open and thus triggers an alarm in the user's monitoring system.

Useful information about the Alarm contacts:

1. There are four terminal blocks (1,2,3,4) provided next to the power input.
2. The left two pins (1,2) are hardware operated
3. The right two pins (3,4) are software operated
4. These are both NC (normally closed) relays
5. The switch's software operation needs to be enabled and set to get the Alarm traps. For detailed information about the Software Alarm and software control of SNMP alarm traps, please reference the Magnum MNS-DX Software User Manual.

The Alarm Contacts are located to the left of the power input connection of the Magnum 10ETS/XTS unit and are green in color as shown in the picture.

Alarm contact ratings (resistive): 220 VDC / 0.27A - 60W
250VAC / 0.25A - 62.5VA
30VDC / 2A - 60W

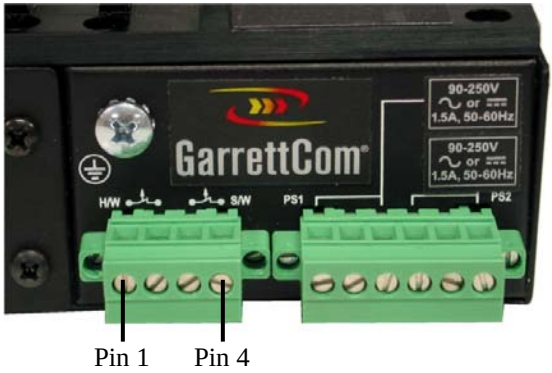


Fig 3.5a Alarm Contacts:
(1,2) hardware controlled
(3,4) software controlled

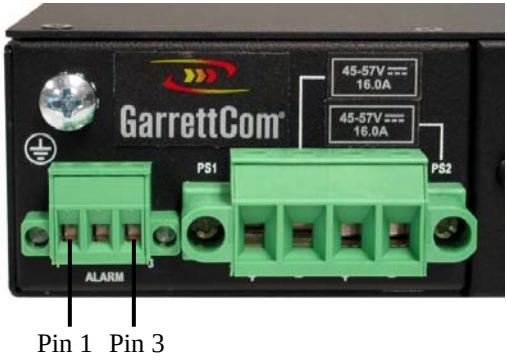
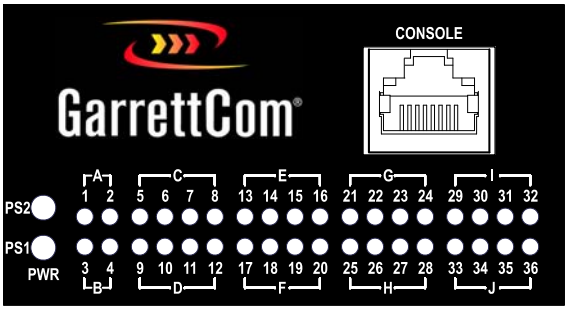


Fig 3.5b PoE Alarm Contacts: (software controlled)
(1) NO (normally open)
(2) Common
(3) NC (normally closed)

3.6 Connecting the Console Terminal



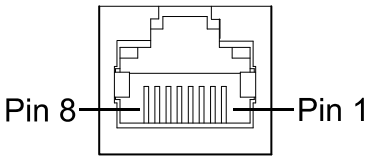
Use a (RJ45) "null modem" cable to connect the Console Port (the RJ45 Console port on the 10ETS/XTS) to your PC, so that your PC becomes the 10ETS/XTS Console Terminal.

Note: The RJ45 null modem cable is not included with the 10ETS/XTS package, but two models are available for purchase. Model CONSOLE-CBLQD has a DB-9 on the PC end, while Model CONSOLE-CBLQU has a USB connector on the computer end.

***Note: For a detailed description of Managed Network Software (MNS-DX) and Magnum 10ETS/XTS Server software configuration for Network Management, please refer** to **Magnum DX Software Manual** available on GarrettCom's FTP site.*

Also available on GarrettCom's website at:
http://www.garrettcom.com/techsupport/sw_downloads.htm

3.6.1 RJ45 Console port pin assignments



Pin	Signal	Description
1	RTS	Request to Send
2	open	not used
3	TXD	Transmit Data (Out)
4	GND	Signal Ground
5	open	not used
6	RXD	Receive Data (In)
7	open	not used
8	CTS	Clear to Send

The above provided information enables a managed station (a PC or a Console terminal) to connect directly to the 10ETS/XTS.

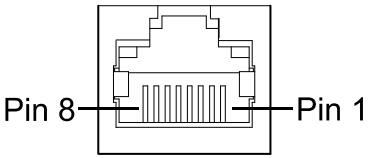
Note: To use the Console port to configure the managed switch, a serial (Null-modem) male to male cable is required to communicate properly. The Null-Modem (RJ45) cable is optional and can be ordered from the factory, along with the unit as:

CONSOLE-CBLQD for serial port
CONSOLE-CBLQU for USB port

NOTE for Power Substations: *In support of the IEEE 1613 Class 2 standard, GCI advises that, for substation applications, the serial (RJ45) console ports are intended for temporary connectivity to other equipment such as PCs. Since the console port connection is temporary, it is excluded from IEEE 1613 packet-loss testing per the 1613 standard-defined test procedure.*

3.7 Module pin assignments

RJ45 Serial ports

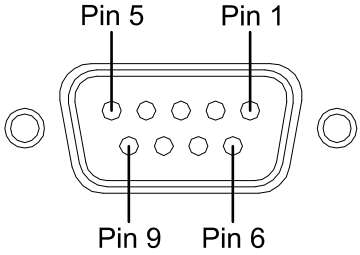


Pin	Signal	Description (Direction)
1	DSR/RI	Data Set Ready or Ring Indicator (In)
2	DCD	Data Carrier Detect (In)
3	DTR	Data Terminal Ready (Out)
4	GND	Signal Ground
5	RXD	Receive Data (In)
6	TXD	Transmit Data (Out)
7	CTS	Clear to Send (In)
8	RTS	Request to Send (Out)

for IRIG applications

Pin	Signal	Description (Direction)
1	NC	Not used
2	IRIGb	IRIG Clock signal (Out)
3	IRIGb RTN	IRIG Clock return (Ground)
4	GND	Signal Ground
5	RXD	Receive Data (In)
6	TXD	Transmit Data (Out)
7	CTS	Clear to Send (In)
8	RTS	Request to Send (Out)

DB9 (Female) Serial ports – RS232 w/ IRIG-B (10TS2-DB9-X-IRIGB)

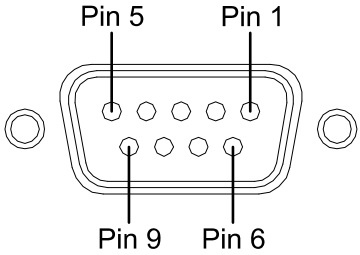


Pin	Signal	Description (Direction)
1	NC	Not Used
2	RXD	Receive Data (In)
3	TXD	Transmit Data (Out)
4	IRIGb	IRIG Clock signal (Out)
5	GND	Signal Ground
6	IRIGb RTN	IRIG Clock return (Ground)
7	RTS	Request to Send (Out)
8	CTS	Clear to Send (In)
9	NC	Not Used

DB9 (Female) Serial ports – RS485 w/ IRIG-B

Pin	Signal	Description (Direction)
1	RX-	Receive – (In)
2	RX+	Receive + (In)
3	TX-	Transmit – (Out)
4	IRIGb	IRIG Clock signal (Out)
5	GND	Signal Ground
6	IRIGb RTN	IRIG Clock return (Ground)
7	NC	Not used
8	NC	Not used
9	TX+	Transmit + (Out)

DB9 (Female) Serial ports – RS232 DCE (10TS2-DB9-DCE)

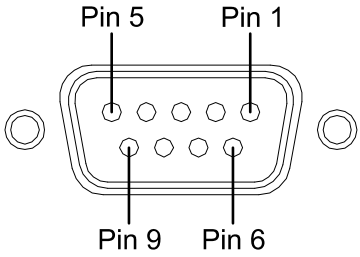


Pin	Signal	Description (Direction)
1	NC	Not used
2	TXD	Transmit Data (Out)
3	RXD	Receive Data (In)
4	NC	Not used
5	GND	Signal Ground
6	NC	Not used
7	CTS	Clear to Send (In)
8	RTS	Request to Send (Out)
9	NC	Not used

DB9 (Female) Serial ports – RS232 DCE w/ IRIG-B (10TS2-DB9-DCE-IRIGB)

Pin	Signal	Description (Direction)
1	NC	Not used
2	TXD	Transmit Data (Out)
3	RXD	Receive Data (In)
4	IRIGb	IRIG Clock signal (Out)
5	GND	Signal Ground
6	IRIGb RTN	IRIG Clock return (Ground)
7	CTS	Clear to Send (In)
8	RTS	Request to Send (Out)
9	NC	Not used

DB9 (Female) Serial ports – RS232 DTE (10TS2-DB9-DTE)

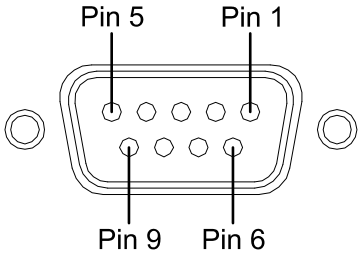


Pin	Signal	Description (Direction)
1	DCD	Data Carrier Detect (In)
2	RXD	Receive Data (In)
3	TXD	Transmit Data (Out)
4	DTR	Data Terminal Ready (Out)
5	GND	Signal Ground
6	DSR	Data Set Ready (In)
7	RTS	Request to Send (Out)
8	CTS	Clear to Send (In)
9	RI	Ring Indicator (In)

DB9 (Female) Serial ports – RS485 DTE

Pin	Signal	Description (Direction)
1	RX-	Receive – (In)
2	RX+	Receive + (In)
3	TX-	Transmit – (Out)
4	TX+	Transmit + (Out)
5	GND	Signal Ground
6	NC	Not used
7	NC	Not used
8	NC	Not used
9	NC	Not used

DB9 (Female) Serial ports – RS232 DTE w/ IRIG-B (10TS2-DB9-DTE-IRIGB)

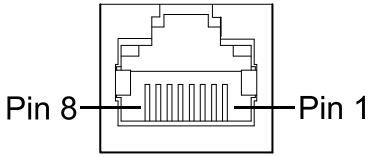


Pin	Signal	Description (Direction)
1	DCD	Data Carrier Detect (In)
2	RXD	Receive Data (In)
3	TXD	Transmit Data (Out)
4	DTR	Data Terminal Ready (Out)
5	GND	Signal Ground
6	IRIGb	IRIG Clock signal (Out)
7	RTS	Request to Send (Out)
8	CTS	Clear to Send (In)
9	IRIGb RTN	IRIG Clock return (Ground)

DB9 (Female) Serial ports – RS485 DTE w/ IRIG-B

Pin	Signal	Description (Direction)
1	RX-	Receive – (In)
2	RX+	Receive + (In)
3	TX-	Transmit – (Out)
4	TX+	Transmit + (Out)
5	GND	Signal Ground
6	IRIGb	IRIG Clock signal (Out)
7	NC	Not used
8	NC	Not used
9	IRIGb RTN	IRIG Clock return (Ground)

RJ48 T1/E1 Adapter ports



Pin	Signal	Description (Direction)
1	RX Data - Ring	Receive (In)
2	RX Data - Tip	Receive (In)
3	NC	Not used
4	TX Data - Ring	Transmit (Out)
5	TX Data - Tip	Transmit (Out)
6	NC	Not used
7	NC	Not used
8	NC	Not used

4.0 OPERATION

This chapter describes the functions and operation of the Magnum 10ETS/XTS Terminal Server.

4.1 Switching Functionality

A Magnum 10ETS/XTS provides switched connectivity at Ethernet wire-speed among all of its Ethernet ports. The Magnum 10ETS/XTS supports 10/100Mbs for copper media and 100Mbs separate traffic domains for fiber ports to maximize bandwidth utilization and network performance. All ports can communicate to all other ports in a Magnum 10ETS/XTS, but local traffic on a port will not consume any of the bandwidth on any other port.

The Magnum 10ETS/XTS units are plug-and-play devices. There is no software configuring necessary to be done for basic operation at installation or for maintenance. There is an optional Half / Full duplex mode and 10Mbps or 100Mbps selection for the switched ports which must be configured through MNS-DX management software per unit as per the requirement. The internal functions of both are described below.

Filtering and Forwarding

Each time a packet arrives on one of the switched ports, the decision is taken to either filter or to forward the packet. Packets whose source and destination addresses are on the same port segment will be filtered, constraining them to that one port and relieving the rest of the network from having to process them. A packet whose destination address is on another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed. Traffic needed for maintaining the un-interrupted operation of the network (such as occasional multi-cast packets) is forwarded to all ports.

The Magnum 10ETS/XTS operates in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

Address Learning

All Magnum 10ETS/XTS units have address table capacities of 8K node addresses suitable for use in larger networks. They are self-learning, so as nodes are added, removed or moved from one segment to another, the 10ETS/XTS automatically keeps up with node locations.

An address-aging algorithm causes least-used addresses to fall out in favor for frequently-used addresses. To reset the address buffer, cycle power down-and-up.

4.2 Auto-Cross (MDIX) and Auto-negotiation, for Ethernet RJ45 ports

The RJ45 ports independently support auto-cross (MDI or MDIX) in auto-negotiation mode and will work properly with all the other connected devices with RJ45 ports whether they support Auto-negotiation (e.g 10Mb Hub, media converter) or fixed mode at 10Mb or 100Mb Half/Full Duplex(managed switch) or not. No cross-over cable is required while using the 10ETS/XTS's copper port to other devices. Operation is according to the IEEE 802.3u standard.

The Managed 10ETS/XTS Fast Ethernet copper ports can be set for either fixed 100Mb speed or for 10/100 F/H N-way auto-negotiation per the IEEE802.3u standard. The selection is made via MNS software. The factory default setting is for auto-negotiation. At 10Mb or 100Mb-fixed speed, the user may select half- or full-duplex mode by MNS Software for each RJ45 port separately. For detail information **See Section 2.3 of this manual for information to access the "MNS-DX Software user guide"**

One frequently-used application for the Managed Magnum 10ETS/XTS copper ports is to connect one of them using a fiber media converter to another Switch in the network backbone, or to some other remote 100Mb device. In this case, it is desirable to operate the fiber link at 100Mb speed, and at either half- or full duplex mode depending on the capabilities of the remote device. Standard commercially available Fast Ethernet media converters mostly do not support auto-negotiation properly, and require that the switched port to which they are connected be at the 100Mb fixed speed. Attachments to a 10/100 auto-negotiation port typically will not work properly. The 10ETS/XTS RJ45 ports handle this situation by configuring the ports as per desired through MNS software port settings and can check the port status of each port after the change.

When Magnum 10ETS/XTS RJ45 copper ports are set for auto-negotiation and are connected to another auto-negotiating device, there are 4 different speed and F/H modes possible depending on what the other device supports. These are: (1) 100Mb full-duplex, (2) 100Mb half-duplex, (3) 10 Mb full-duplex and (4) 10 Mb half-duplex. The auto-negotiation logic will attempt to operate in descending order and will normally arrive at the highest order mode that both devices can support at that time. (Since auto-negotiation is potentially an externally controlled process, the original "highest order mode" result can change at any time depending on network changes that may occur). If the device at the other end is not an auto-negotiating device, the 10ETS/XTS RJ45 ports will try to detect its idle signal to determine 10 or 100 speed, and will default to half-duplex at that speed per the IEEE standard.

General information -

Auto-negotiation per-port for 802.3u-compliant switches occurs when:

-- the devices at both ends of the cable are capable of operation at either 10Mb or 100Mb speed and/or in full- or half-duplex mode, and can send/receive auto-negotiation pulses, and . . .

-- the second of the two connected devices is powered up*, i.e., when LINK is established for a port, or

-- the LINK is re-established on a port after being lost temporarily.

- **NOTE** – ***Some NIC cards only auto-negotiate when the computer system that they are part of is powered up. These are exceptions to the "negotiate at LINK – enabled" rule above, but may be occasionally encountered.***

When operating in 100Mb half-duplex mode, cable distances and hop-counts may be limited within that collision domain. The Path Delay Value (PDV) bit-times must account for all devices and cable lengths within that domain. For Magnum 10ETS/XTS Fast Ethernet switched ports operating at 100Mb half-duplex, the bit time delay is 50BT.

4.3 Packet Prioritization, 802.1p QOS

Quality of Service (QOS) means providing consistent predictable data delivery to users from datagram paths that go all across a network. As a LAN device, the Magnum 10ETS/XTS can do its part to prevent any QOS degradation while it is handling Ethernet traffic through its ports and internal switch buffers.

The Magnum 10ETS/XTS switching hardware supports the IEEE 802.1p standard, and fulfills its role in support of QOS, giving packet processing priority to priority-tagged packets according to the 802.1p standard. In addition to hardware support for QOS, the MNS software supports four priority queues that can be shared across the eight levels of defined packet priorities for application-specific priority control by the user through software configuration settings.

4.4 Frame Buffering

Magnum 10ETS/XTS's are store-and-forward switches. Each frame (or packet) is loaded into the Switch's memory and inspected before forwarding can occur. This technique ensures that all forwarded frames are of a valid length and have the correct CRC, i.e., are good packets. This eliminates the propagation of bad packets, enabling all of the available bandwidth to be used for valid information.

While other switching technologies (such as "cut-through" or "express") impose minimal frame latency, they will also permit bad frames to propagate out to the Ethernet segments connected. The "cut-through" technique permits collision fragment frames (which are a result of late collisions) to be forwarded which add to the network traffic. Since there is no way to filter frames with a bad CRC (the entire frame must be

present in order for CRC to be calculated), the result of indiscriminate cut-through forwarding is greater traffic congestion, especially at peak activity. Since collisions and bad packets are more likely when traffic is heavy, the result of store-and-forward operation is that more bandwidth is available for good packets when the traffic load is greatest.

When the Magnum 10ETS/XTS Terminal Server detects that its free buffer queue space is low, the Switch sends industry standard (full-duplex only) PAUSE packets out to the devices sending it packets to cause “flow control”. This tells the sending devices to temporarily stop sending traffic, which allows the traffic to catch-up without dropping packets. Then, normal packet buffering and processing resumes. This flow-control sequence occurs in a small fraction of a second and is transparent to an observer.

4.5 Flow-control, IEEE 802.3x standard

The Magnum 10ETS/XTS incorporates a flow-control mechanism for Full-Duplex mode. The purpose of flow-control is to reduce the risk of data loss if a long burst of activity causes the switch to save frames until its buffer memory is full. This is most likely to occur when data is moving from a 100Mb port to a 10 Mb port and the 10Mb port is unable to keep up. It can also occur when multiple 100Mb ports are attempting to transmit to one 100Mb port, and in other protracted heavy traffic situations.

The Magnum 10ETS/XTS implements the 802.3x flow control (non-blocking) on Full-Duplex ports, which provides for a “PAUSE” packet to be transmitted to the sender when the packet buffer is nearly filled and there is danger of lost packets. The transmitting device is commanded to stop transmitting into the 10ETS/XTS Switch port for sufficient time to let the Switch reduce the buffer space used. When the available free-buffer queue increases, the Switch will send a “RESUME" packet to tell the transmitter to start sending the packets. Of course, the transmitting device must also support the 802.3x flow control standard in order to communicate properly during normal operation.

Note: When in Half-Duplex mode, the 10ETS/XTS implements a back-pressure algorithm on 10/100 Mb ports for flow control. That is, the switch prevents frames from entering the device by forcing a collision indication on the half-duplex ports that are receiving. This temporary “collision” delay allows the available buffer space to improve as the switch catches up with the traffic flow.

4.6 Power Budget Calculations for Modules with Fiber Media

Receiver Sensitivity and Transmitter Power are the parameters necessary to compute the power budget. To calculate the power budget of different fiber media installations using Magnum products, the following equations should be used:

OPB (Optical Power Budget) = P_T(min) - P_R(min)

where P_T = Transmitter Output Power, and P_R = Receiver Sensitivity

Worst case OPB = OPB - 1dB(for LED aging) - 1dB(for insertion loss)

Worst case distance = {Worst case OPB, in dB} / [Cable Loss, in dB/Km]

where the "Cable Loss" for 62.5/125 and 50/125μm (M.m) is 2.8 dB/km,
and the "Cable Loss" for 100/140 (Multimode) is 3.3 dB/km,
and the "Cable Loss" for 9/125 (Singlemode) is 0.5 dB/km
and the "Cable Loss" for 9/125 (Singlemode) is 0.4 dB/km (LX25)
and the "Cable Loss" for 9/125 (Singlemode) is 0.25 dB/km (ZX40)
and the "Cable Loss" for 9/125 (Singlemode) is 0.2 dB/km (ZX70)

See http://www.garrettcom.com/techsupport/power_budget.pdf for more information on Power budget calculations

5.0 MAGNUM 10ETS/XTS TERMINAL SERVER PORT MODULES

This chapter describes each Port Module, including appearance, functionality, and status displays.

5.1 10ETS/XTS Modules

An important feature of the Magnum 10ETS/XTS is the use of Port Modules for flexible mixed-media connectivity to RJ45 copper and various fiber media. The first two slots (A & B) of the Magnum 10ETS/XTS are fixed RJ45 auto-negotiating copper ports or SFP (Small Form Pluggable) fiber ports with 100Mbps capability. Additionally, the switch can accept one additional Ethernet Port Module in slot C and six Serial port modules in Slots D,E,F,G,H and J and a T1/E1 WAN adapter in Slot I.

Note: **The 10ETS/XTS Port Modules are not identical to the port modules used in other GarrettCom 6K switch products. For information about other GarrettCom products, please see the applicable product manual. For a list of 10ETS/XTS Port Modules, refer to Section 1.2**

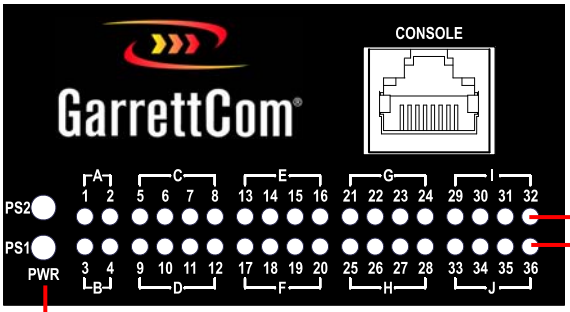
Each 10ETS/XTS Port Module is individually described in the following section.

5.1.1 10ETS/XTS Module LED designations

All ports have the following LED designations:

L/A = Link / Activity
Off (No Link established)
ON (Link established)
BLINKING (Link Activity)

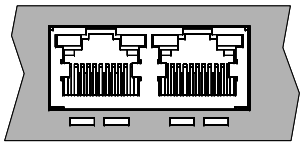
LED panel:



Link indicator (Illuminated when Link is established to that port)

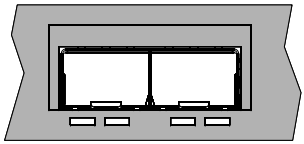
Power Indicator – PS1, PS2
(Illuminated when power is supplied to the internal power supply)

5.1.2 10TS2-RJ45, two 10/100Mb RJ45 ports (use in Slots A / B)



The 10TS2-RJ45 two-port copper module provides two 10/100Mb switched RJ45 ports. (see Section 5.1.5 for more details)

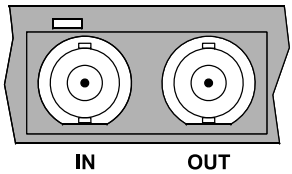
5.1.3 10TS2-HSFP, two 100Mb open SFP ports (use in Slots A / B)



The 10TS2-HSFP two port module provides two 100Mb open SFP ports, supporting distances up to 40km. This module provides the same functions as 10K4-MLC (see Section 5.1.7 for more details).

SFP Transceivers are available with multimode 1310nm (2km), singlemode 1310nm (20km) and singlemode 1550nm (40km) fiber options, as well as RJ45 copper. (see Sec. 1.2 of this manual for available part numbers)

5.1.4 IRIGB-TMODULE, two BNC connectors (use in Slot B)

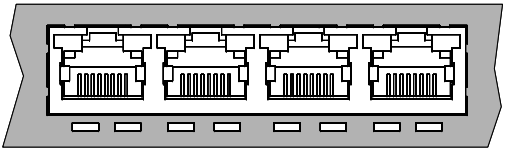


The IRIG-B Timing module provides two BNC connectors (signal-in and signal-out) to provide IRIG-B timing information to be transmitted to the IRIG-B enabled serial modules for 10ETS/XTS. This provides the devices connected to the 10ETS/XTS serial module ports in Slots C-J to receive the timing signals and synchronize their clocking from the IRIG-B signals.

The signal-out port can be used for cascading IRIG-B signals to other IRIG-B capable devices. The signals used and transmitted are TTL signals. The IRIG-B signals are propagated on RS232 or RS485 signals.

A low-loss Belden cable is recommended for IRIG-B connections.

5.1.5 10K4-RJ45, four 10/100Mb RJ45 ports (use in Slot C)



The 10K4-RJ45 four-port copper module provides four 10/100Mb switched RJ45 ports. The 10/100Mb switched ports normally (as a default setting) are independently N-way auto-negotiating and auto-crossover (MDIX) for operation at 10 or 100Mb speed in full- or half-duplex mode. (i.e., each independently selects a mode and speed to match the device at the other end of the twisted pair cable).

(for auto-negotiation and MDIX details, see Section 4.2 in this User Guide)

There is one LED per RJ45 port on the module; for Link/Activity. For the 10K4-RJ45 LED designations, see Section 5.1.1.

A twisted pair cable must be connected into an RJ45 port and the Link (L/A) indicator for that port must be ON (indicating there is a powered-up device at the other end of the cable) in order for the L/A LED to provide valid indications of operating conditions on that port.

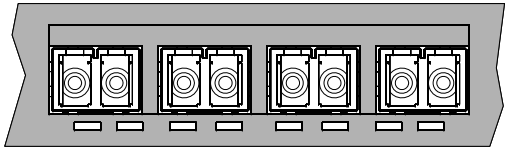
Using the management software (MNS-DX or MNS-DX-SECURE), the user may disable auto-negotiation and fix the desired operation of each RJ45 port. The user may select 10Mb or 100Mb speed and full- or half-duplex mode per-port as required. (See the Magnum MNS-DX Software Manual for additional info)

NOTE: for Power Substations: *In support of the IEEE 1613 Class 2 standard, GCI advises that, for substation applications, the RJ45 ports are intended for connectivity to other communication equipment such as routers or telecommunication multiplexers installed in close proximity (i.e., less than 2 meters or 6.5ft) to the 10ETS/XTS. It is not recommended to use these ports in substation applications to interface to field devices across distances which could produce high (greater than 2500V) levels of ground potential rise (GPR) during line-to-ground fault conditions. The 10ETS/XTS passes the 1613 specifications for zero packet loss with fiber ports and with RJ45 ports used as indicated here.*

5.1.6 10K4PX-RJ45, four 10/100Mb PoE+ RJ45 ports (use in Slot C)

A module similar to Model 10K4-RJ45 is also available with PoE+ 802.3at support that provides 25 Watts per port output when used in conjunction with the 10ETSP/10XTSP chassis.

5.1.7 10K4-MLC, four Multimode LC (use in Slot C)



The 10K4-MLC four-port fiber module provides four 100Mb Multimode LC Fiber ports.

The 10K4-MLC fiber ports are Small Form Factor (SFF) LC Multimode connectors used primarily in 100Mbps fiber-to-IED links in industrial applications. When installed in a Magnum 10ETS/XTS, it supports fiber optic cable distances up to the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex.

The compact size of the LC Connector reduces the size of wiring panels in wiring closets while providing the advantage of "future-proof" fiber optic technology.

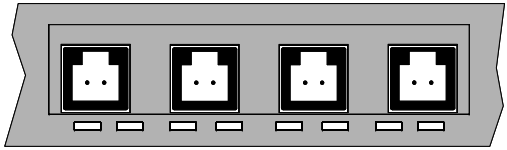
The cable end is a "plug-in" connector with both fiber strands terminated in one housing that cannot be improperly inserted. Each port has a Link/Activity (L/A) LED indicating proper connectivity (Link) with the remote device when lit and blinking (Activity), indicating packets being received.

5.1.8 10K4-SLC, 10K4-SLCL, four Singlemode LC (use in Slot C)

The 10K4-SLC 4-port Fiber module provides four 100Mb Singlemode LC Fiber ports, supporting distances up to 20km. This module provides the same functions as the Multimode version (see Section 5.1.7 for more details).

The 10K4-SLCL 4-port Fiber module provides four 100Mb Singlemode LC (Long Reach) Fiber ports, supporting distances up to 40km. This module provides the same functions as the Multimode version (see Section 5.1.7 for more details).

5.1.9 10K4-MTRJ, four Multimode MTRJ (use in Slot C)

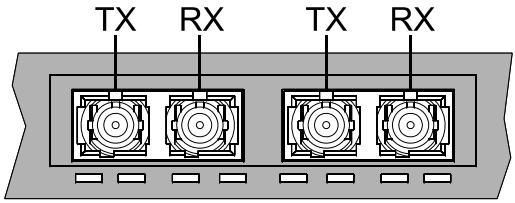


The 10K4-MTRJ four-port fiber module provides four 100Mb Multimode MTRJ Fiber ports.

The 10K4-MTRJ fiber port is a Small Form Factor (SFF) MTRJ Multimode connector. The MTRJ's small size and ease of connection make it a good choice for 100Mbps "fiber-to-the-desktop" Ethernet connectivity. When installed in a Magnum 10ETS/XTS, it supports fiber optic cable distances up to the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex.

The cable end is a "plug-in" connector with both fiber strands terminated in one housing that cannot be improperly inserted. Each port has a Link/Activity (L/A) LED indicating proper connectivity (Link) with the remote device when lit and blinking (Activity), indicating packets being received.

5.1.10 10K2-MSC, 10K2-MST (use in Slot C) Two SC Multimode or two ST Multimode



The 10K2-MSC (shown) two-port fiber module provides two 100Mb Multimode SC Fiber ports. This option utilizes a SC-type "push-pull" fiber optic connection.

The 10K2-MST two-port fiber module provides two 100Mb Multimode ST Fiber ports. This option utilizes a ST-type "twist-lock" fiber optic connection.

The 100Mb Multimode SC and ST ports typically support fiber optic cable distances up to the IEEE standard 100Mbps distance limits, typically 2km at full-duplex.

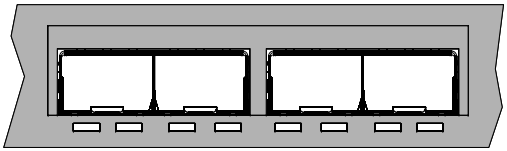
Each port has a Link/Activity (L/A) LED indicating proper connectivity (Link) with the remote device when lit and blinking (Activity), indicating packets being received.

5.1.11 10K2-SSC, 10K2-SSCL (use in Slot C) Two SC Singlemode

The 10K2-SSC two-port fiber module provides two 100Mb Singlemode SC Fiber ports, supporting distances up to 20km. This module provides the same functions as the Multimode version (see Section 5.1.10 for more details).

The 10K2-SSCL two-port Fiber module provides two 100Mb Singlemode SC (Long Reach) Fiber ports, supporting distances up to 40km. This module provides the same functions as the Multimode version (see Section 5.1.10 for more details).

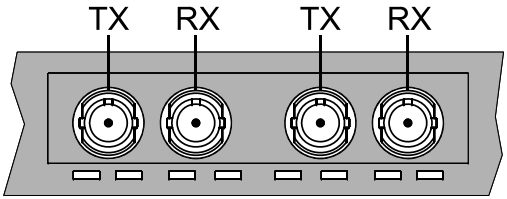
5.1.12 10K4-FXSFP, four open 100Mb SFP slots (use in Slot C)



The 10K4-FXSFP four port module provides four 100Mb open SFP ports, supporting distances up to 40km. This module provides the same functions as 10K4-MLC (see Section 5.1.7 for more details).

SFP Transceivers are available with multimode 1310nm (2km), singlemode 1310nm (20km) and singlemode 1550nm (40km) fiber options, as well as RJ45 copper. (see Sec. 1.2 of this manual for available part numbers)

5.1.13 10K2-F10ST, Two 10Mb ST Multimode (use in Slot C)

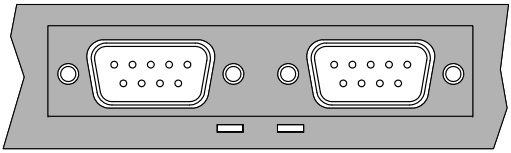


The 10K2-F10ST two-port fiber module provides two 10Mb Multimode ST Fiber ports. This option utilizes a ST-type “twist-lock” fiber optic connection.

The 10Mb Multimode ST ports typically support fiber optic cable distances up to the IEEE standard 10Mbps distance limits, typically 2km at full-duplex.

Each port has a Link/Activity (L/A) LED indicating proper connectivity (Link) with the remote device when lit and blinking (Activity), indicating packets being received.

5.1.14 10TS2-DB9, DB-9 Serial module (use in Slots C-J)

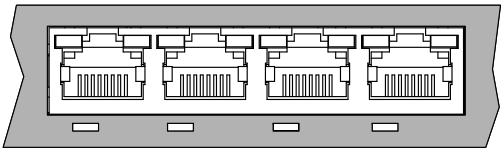


The 10TS2-DB9 is a two DB-9 serial port module for 10ETS/XTS. Each serial port module can be ordered as RS232 only (DCE) or RS232 / RS485 / RS422 (DTE). See Section 1.2 for ordering information. MNS-DX licensed software includes support for Async to TCP/IP connectivity, Serial-IP terminal services, Serial Port VLANs and secure management of serial ports.

Also available with IRIG-B signals for time synchronization.

NOTE: Module model# **IRIGB-TMODULE** is required in Slot-B to enable the module to transmit the timing information.

5.1.15 10TS4-RJ45, RJ45 Serial module (use in Slots C-J)

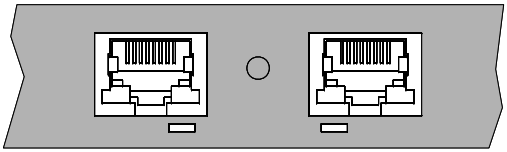


The 10TS4-RJ45 is a four RJ45 serial port module for 10ETS/XTS. Each serial port is RS232 / RS485 / RS422, software selectable by the user at system initialization. MNS-DX licensed software includes support for Async to TCP/IP connectivity, Serial-IP terminal services, Serial Port VLANs and secure management of serial ports.

Also available with IRIG-B signals (module model# **10TS4-RJ45-IRIGB**) for time synchronization.

NOTE: Module model# **IRIGB-TMODULE** is required in Slot-B to enable the module to transmit the timing information.

5.1.16 10-2T1E1, Dual T1/E1 WAN adapter (use in Slot I only)



The 10-2T1E1 Dual T1/E1 adapter is a two-port WAN interface module that provides T1 (1.544 Mbps) and E1 (2.048 Mbps) data line rates.

NOTE: This module is only available in Slot I.

6.0 TROUBLESHOOTING

All Magnum products are designed to provide reliability and consistently high performance in all industrial network environments. The installation of a Magnum 10ETS/XTS is a straight forward procedure. The operation is also straightforward and is discussed in Section 4.0 of this User Guide.

Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of the procedures described in this section or if the Magnum 10ETS/XTS is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact GarrettCom Customer Support.

6.1 Before Calling for Assistance

1. If difficulty is encountered when installing or operating the unit, refer back to the Installation Section of the applicable chapter of this manual. Also check to make sure that the various components of the network are interoperable.
2. Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)
3. Make sure that power is properly attached to each Magnum 10ETS/XTS unit. Use the PWR LEDs to verify each unit is receiving power.
4. If the problem is isolated to a network device other than the Magnum 10ETS/XTS product, it is recommended that the problem device be replaced with a known good device. Verify whether or not the problem is corrected. If not, go to Step 5 below. If the problem is corrected, the Magnum 10ETS and its associated cables are functioning properly.
5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum 10ETS/XTS Terminal Server unit or if unknown, contact GarrettCom, Inc. by fax, phone or email (*support@garrettcom.com*) for assistance.

6.2 When Calling for Assistance

Please be prepared to provide the following information.

1. A complete description of the problem, including the following points:
   a. The nature and duration of the problem;
   b. Situations when the problem occurs;
   c. The components involved in the problem;
   d. Any particular application that, when used, appears to create the problem;
2. An accurate list of GarrettCom product model(s) involved, with serial number(s). Include the date(s) that you purchased the products from your supplier.
3. It is useful to include other network equipment models and related hardware, including personal computers, workstations, terminals and printers; plus, the various network media types being used.
4. A record of changes that have been made to your network configuration prior to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

6.3 Return Material Authorization (RMA) Procedure

All returns for repair must be accompanied by a Return Material Authorization (RMA) number. To obtain an RMA number, please use this URL - **https://rma.garrettcom.com/rma/rma_request_noaccount.php** to fill out the form. Please have the following information readily available:

Name and phone number of your contact person.
Name of your company / institution
Your shipping address
Product name
Serial Number (or Invoice Number)
Packing List Number (or Sales Order Number)
Date of installation
Failure symptoms, including a full description of the problem.

GarrettCom will carefully test and evaluate all returned products, will repair products that are under warranty at no charge, and will return the warranty-repaired units to the sender with shipping charges prepaid (see Belden Americas Terms & Conditions for warranty information). However, if the problem or condition causing the return cannot be duplicated by GarrettCom, the unit will be returned as:

No Problem Found.

GarrettCom reserves the right to charge for the testing of non-defective units under warranty. Testing and repair of product that is not under warranty will result in a customer (user) charge.

6.4 Shipping and Packaging Information

Should you need to ship the unit back to GarrettCom, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.)

CAUTION: Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.
3. GarrettCom is not responsible for your return shipping charges.
4. Ship the package to:

   GarrettCom, Inc.

   47823 Westinghouse Dr.

   Fremont, CA 94539

   Attn.: Customer Service

APPENDIX A: DC Power Input

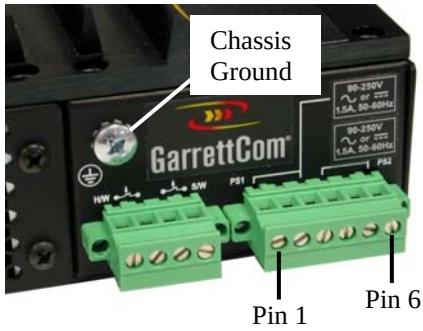
A1.0 Specifications for Magnum 10ETS/XTS, DC Power at 24/48VDC and 90-250 AC/DC Power input

Each Magnum Model 10ETS/XTS requires DC power input, at 24/48VDC and 90-250 AC/DC nominal. The wide range of DC power input types qualifies this product for use in 24/48VDC and 90-250 AC/DC applications in different industries.

DC Power Terminals: "+", "**-**" are internally floating so that user may ground either

PS1 (Power Supply 1)
- Pin 1: - (Negative)/N
- Pin 2: + (Positive)/L
- Pin 3: Ground

PS2 (Power Supply 2)
- Pin 4: Ground
- Pin 5: - (Negative)/N
- Pin 6: + (Positive)/L



Chassis Ground: ground wire connection to the chassis (#10-32 thread)

Power Consumption:

20 watts typical (for fully populated unit)

(L) 24/48VDC Power Input nominal (range 22 to 60VDC)

for PoE applications:

PoE+ 802.3at: (L) 48VDC Power Input (range 52 to 56VDC)

(H) AC/DC Power Input nominal (range 90 to 250V)

Standard DC Power Input Terminal Block : " -, +, GND "

See also Section 1.0, Technical Specifications, for the 10ETS/XTS base unit.

A2.0 10ETS/XTS, 24/48VDC, 90-250VDC INSTALLATION

This section describes the proper connection of the 24/48VDC, leads to the DC power terminal block on the Magnum 10ETS/XTS Terminal Server. The DC terminal block on the Magnum 10ETS/XTS is located on the right rear or left front (Reverse unit) of the unit and is equipped with four (6) screw-down lead posts. The power terminals are identified as positive (+/L) and negative (-/N), and they are electrically floating inside the unit so that either may be grounded by the user if desired. The chassis is "earth" or ground (GND).

The connection procedure is straightforward. Simply insert the DC leads to the Switch's power terminals, positive (+/L) and negative (-/N) screws. The use of Ground (GND) connects to the Switch chassis screw provided under the DC terminal. Ensure that each lead is securely tightened.

Note: The GND should be hooked up first. The 10ETS/XTS unit has a floating ground, so the user may elect to Ground either + or - terminal to suit the customer's use. Before connecting live power lines to the terminal block, always use a digital voltmeter to measure the output voltage of the power supply and determine the lead which is more "+ve potential". The more "+ve" voltage lead from a +ve or –ve power supply must be connected to the post labeled "+".

When power is applied, the green PWR LED will illuminate.

Note: The 10ETS/XTS unit has a floating ground, so the user may elect to Ground either + or - terminal to suit the customer's use.

A2.1 UL Requirements for DC-powered units

<u>CAUTION:</u> 48VDC products shall be installed with a readily accessible disconnect device in the building installation supply circuit to the product.

Minimum 18AWG cable for connection to a Centralized DC power source.

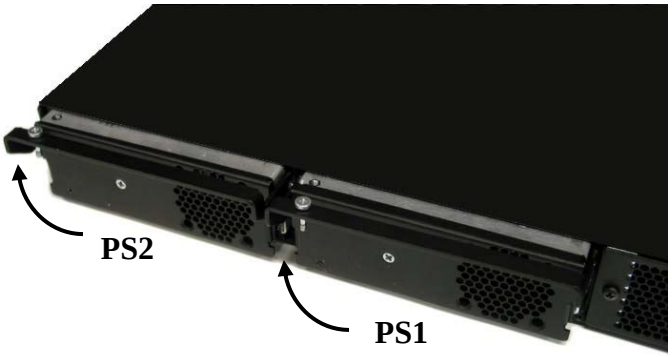
1. *Minimum 14AWG cable for connection to an earth wiring.*
2. *Use only with Listed 10A circuit breaker provided in building installation.*
3. *"Complies with FDA radiation performance standards, 21 CFR subchapter J." or equivalent.*
4. *Fastening torque of the lugs on the terminal block: 9 inch-pound max.*
5. *To secure a centralized DC Power Source cable , use at least four cable ties to secure the cable to the rack at least 4 inches apart, with the first one located within 6 inches of the terminal block.*

APPENDIX B: Removal / Installation of the Hot-Swap power supply

Tools Required:

1 #1 Phillips head screwdriver

Step 1: Locate the Hot-Swap power supply locking screw.
Loosen the locking screw until no longer engaged.



Step 2: Lift the Hot-Swap power supply handle (shown above) to disengage from the 10ETS/XTS chassis.

Step 3: Slide out the power supply from the chassis. For installation, reverse the order.